

THURSDAY, MARCH 14, 1878

## THE LOCUST PLAGUE IN AMERICA

*The Locust Plague in the United States; being more particularly a Treatise on the Rocky Mountain Locust, or so-called Grasshopper, as it occurs East of the Rocky Mountains, with Practical Recommendations for its Destruction.* By Charles V. Riley, M.A., Ph.D., State Entomologist of Missouri, &c. With 45 Illustrations. (Chicago: Rand, McNally, and Co., 1877.)

THE greater part of this treatise has already appeared in the Entomological Reports published annually for some years past by Mr. Riley, as State Entomologist for Missouri, in which the information was given piecemeal from time to time as it was acquired. The whole is now brought together in a connected and systematic form, and we have in it a very complete and valuable treatise on the different kinds of locusts, whether species or varieties, which have proved destructive in North America. Ever since the discovery and colonisation of that continent the new settlements have been from time to time subject more or less to scarcities resulting from the invasions or migrations of these insects. These have gradually, however, become scarcer and scarcer, and confined more and more to the interior as the insects retreated before the advancing wave of civilisation and cultivation, until now their ravages do not extend eastwards beyond the 16th or 17th degree of longitude west of Washington; in other words, the regions lying to the east of the Mississippi are now nearly free from them, and it is only in those lying to the west of that river that their propagation and migrations take place on such a scale as seriously to affect the property and prosperity of the settlers. It is not that the species originally inhabiting the eastern coast have been gradually pushed back to the interior, but that the species peculiar to it have been reduced in number in the cultivated districts, and their rôle has been successively taken up by other species lying more inland as civilisation has gradually advanced. The species on which that mission has now devolved are two or three that have their home and permanent breeding-place in the Rocky Mountains—we say *permanent* in contradistinction to temporary breeding-place, because when they make their migrations, they often rest and breed at its furthest limit, the brood returning in the following year to the country from which their parents came, although not necessarily by the same route. The route by which they have hitherto invaded the countries to the east of their proper home in the Rocky Mountains has been from north-west to south-east. That by which the fresh-bred swarms sprung from the invaders have made their way back again next year, has been from south-east to north-west, but not absolutely in the same line by which their parents came, but either parallel to it or slightly divergent. Their course of invasion has been carefully traced for many years by Mr. Riley and others, and the fact of their return on their footsteps in this way is beyond question; but it is also beyond doubt that the new brood does not go back so strong or so numerous as their parents came. Their constitution appears to be sapped by the change of

climate or condition of life; they are feeble and infested by parasites, so that a large proportion of them die a natural death—a consideration which doubtless explains why the vast swarms which have passed from one country to another in all ages and in all quarters of the globe, seem never to have made good a permanent footing in the country they have invaded; at all events never in numbers at all corresponding to the force of the intruders. This is no doubt but small consolation to settlers living on the borders of a locust-stricken land, but it is better than none—they would be still worse off if the locusts were to remain as a permanent incubus instead of only coming occasionally as a ravaging horde.

Of the amount of injury done by the invading hosts, especially during the more recent invasions of 1873 and following years, Mr. Riley gives a striking account. Where a territory of hundreds of miles in extent is struck with desolation in a few days or weeks through the ravages of an insect, it is scarcely possible to speak of it without exaggeration, and some qualification will almost certainly have to be made upon any estimate of the amount of damage supposed to have been sustained, especially when, as here, we know how little the data on which the estimates are founded are to be relied on. In Great Britain we have now an elaborate machinery by which reliable agricultural returns are obtained; the land, or most of it, has been measured and mapped out; the best means are taken to obtain true and correct returns, and when obtained they are checked by competent and trustworthy experts; so that no error of any magnitude can well creep in without detection. It is otherwise on the prairies west of Missouri. The admirable United States Surveys, although sufficiently perfect and on a sufficiently large scale to answer all general purposes, have no pretensions to such detail as we have adopted in our Ordnance Survey Maps, and no attempt is made to give the acreage of the different plots in cultivation (which, besides, would be useless, as it is an uncertain quantity, varying every year). At the best, therefore, there are no other means of estimating either the amount in cultivation or the amount of damage inflicted on it than an empirical estimate furnished by the farmers themselves, a mode of calculation open to many objections, and requiring much allowance. Still, giving the widest margin, enough remains behind to satisfy the hungriest appetite for startling results. If actual starvation did not come in the locusts' train, poverty and distress did. In 1874 the loss to three exposed, although thinly-peopled, states, Wyoming, Dakota, and Montana, is said to have been fifty millions of dollars; and in 1875 it was calculated that about three-quarters of a million of people were made sufferers on a strip of about twenty-five miles broad along the banks of the Missouri, from Omaha to Kansas.

Mr. Riley gives many statistics on such points. His information regarding the habits of the locusts and their enemies, and the best way of dealing with them, is also ample; and his scientific descriptions and natural history of the species in all their stages leave nothing to be desired. He even touches upon their value as food either with or without wild honey, and gives the results of his experience as to the best mode of cooking them. During a visit that he paid to this country, some two or three years ago, he brought some dried potted specimen with him; but that was scarcely fair play to the locusts,

and we shall not say what we thought of them. Let us still be just. If we are to condemn them, let it only be after a trial when they are fresh and good. We have indeed tried them in their native country, pounded up with acorns and mashed into balls by the digger Indians of California; but then acorns would destroy any dish for civilised food, so that we prefer to leave the question of their culinary merits an open one for some gastronomic jury, stipulating only for the right of challenging Mr. Riley, as one of its members, on the score of undue favour and partiality arising from too intimate an acquaintance and familiarity with the individuals under trial.

A further contribution to the subject treated of by Mr. Riley has reached us in the shape of the first two *Bulletins* of the United States Entomological Commission.

ANDREW MURRAY

### ABNEY'S TREATISE ON PHOTOGRAPHY

*A Treatise on Photography.* By W. de Wiveleslie Abney, F.R.S. (London: Longmans and Co., 1878.)

ALL those interested in this most attractive study will welcome Capt. Abney's treatise on photography. Those who wish to become acquainted with the scientific principles on which the practice of photography depends will find in the opening chapters a clear and concise description of the theory of sensitive substances, and of the action of light on various compounds, whilst by studying the closing chapters of the volume they will be able to make themselves acquainted with the present state of our knowledge on the important subjects of actinometry, photo-spectroscopy, and the interesting discoveries made by the author and others on the sensitiveness of different salts, and the methods employed for obtaining pictures of the various portions of the spectrum. On the other hand, the artist photographer will find ample matter for interest in the chapter in which Capt. Abney most successfully lays down the rules which must guide the production of an artistic picture, pointing out the special difficulties under which the photographer lies in the choice of subjects in order to avoid incongruity or inartistic massing of light and shade, and showing the best mode of lighting and arranging the picture by choosing the right point of view for the camera. As an illustration of Capt. Abney's happy style and power of artistic treatment, we may quote the following description of a landscape:—

"In the next picture, we have the distance, or perhaps more strictly speaking, the middle distance as the point of interest. The horizon line is kept in the weakest part, the centre, of the picture. The trees in the foreground are so grouped that they frame the view with dark masses, relieved by the light foliage of some of the nearer bushes and shrubs. The foreground finishes at a distance of about  $\frac{1}{4}$  from the bottom. More of it would take away from the value of the middle distance, as it would place it in the weakest part of the picture—viz., centrally; less of it would have rendered the picture bald, and have cut off part of the deeper shades which are so valuable in giving the effect of distance to the stream beyond. This picture would have been spoilt had the camera been so placed as to give more top foliage, since the bough which now partially crosses the picture at about  $\frac{2}{3}$  the height, would have caused an ugly division, and also the tops of the distant trees, and the sky would have

appeared. This latter, in views such as that under criticism, is objectionable, as patches of white give the eye an inclination to wander off towards it, and it would have been an insufficient precaution to have printed in clouds from another negative, owing to the difficulty that would exist in subduing at the same time the lights on the leaves of the near trees. As it is, the picture is in pictorial focus. By placing the stream to the right or left, the balance would have been wanting, and its general direction would have been altered to such an extent as to have given a feeling that it was a subsidiary part of the picture instead of an essential."

Another important section of the work is devoted to the necessary, but unavoidably dry descriptions of the very numerous photographic processes and manipulations now in vogue, of the construction of apparatus, and a statement of the general laws of geometrical optics so far as concerns the principles on which the construction and use of photographic lenses depend. On all these subjects we find Capt. Abney's statements clear and concise.

Then again no book on photography would be complete without an explanation of the various processes of photo-lithography and photo-engraving, and accordingly we find a short account of the more important of these interesting methods of reproducing photographic effects. To one of these photo-relief printing processes, that discovered by Warnerke, with, we believe, the author's co-operation, we would especially draw attention, the picture being remarkable for the beauty and delicacy, as well as for the force and depth of its tones. The details of this process are not yet published; it cannot, however, be doubted that it is capable of producing the finest effects of a steel or copper-plate engraving.

It is, however, the scientific side of Capt. Abney's book which will especially interest the readers of NATURE. The explanation of the effect of vibration as setting up chemical change in the molecule is clearly set forth in Chapter III. The case in which the atoms are in a stable though verging on an indifferent equilibrium as with the sensitive mixture of chlorine and hydrogen, being well illustrated by the equilibrium of a frustum of a pyramid standing base uppermost on as narrow section of the base as we please. In these cases a very small amount of work is needed to make the systems take up more stable positions. Then "extending our previous illustration, supposing we had a row of such frusta of pyramids, and that it was found that one pellet of a number (all being of equal weight) when striking one frustum with a certain velocity was able to cause it to fall, and also that in every case the accuracy of aim was undoubted, and that in falling one frustum did not strike its neighbour, then at any interval after the commencement of a bombardment the amount of work expended in projecting the pellets could be compared by simply counting the number of frusta which had fallen" (p. 12). The question of the action of vibrations synchronous with the oscillations of the molecule on the stability of the molecule is next discussed, and the explanation rendered clear by a description of Rankine's well-known contrivance of the heavy and light pendulums. The difference between the decomposition of explosives and of bodies employed for photographic purposes in respect to the nature of the disturbing vibrations is thus pointed out. Explosives are affected by long wave rays, photographic actions as a rule being only set up by waves